LETTERS TO THE EDITOR.

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Note on some Red and Blue Pigments.

THE following data are placed on record because interesting in themselves, and in the hope that they may be useful to others who have the opportunity to make further investigations.

(1) A little boraginaceous plant called *Eremocarya micrantha* (Torrey) is common in sandy places at Mesilla Park, New Mexico, flowering in April. A few days ago, Prof. E. O. Wooton called my attention to the fact that its roots are deep red, and stain herbarium paper. Curious to learn more about this peculiar coloration, I made some tests, with the following results :—The pigment is not soluble in water, but it readily dissolves in cold alcohol, forming a beautiful red solution. The roots, after being treated with alcohol, become white, showing that the pigment is entirely superficial, and is apparently an excretion from the root. The red colour is that of the normal or acid state of the pigment, but on adding enough liquor potassæ to make the solution alkaline, the colour immediately becomes a beautiful blue. An excess of strong caustic potash does not destroy the pigment until after a considerable time. Prof. A. Goss tested the delicacy of the colour-reaction in the presence of acids and alkalis, and found that a very small excess of one or the other would give the characteristic colour. The pigment is, of course, an anthocyan, very similar, at least, to litmus ; and it may be that it can be utilised for the same purposes.

(2) It has been remarked more than once that whereas the hind wings of Acridiidæ (grasshoppers) are sometimes blue, sometimes red, and sometimes yellow, species living in the same locality, though of very diverse genera, will often have similarly coloured wings. In the Mesilla Valley we have common species with red and with yellow wings ; but in the Organ Mountains, not far away, I found two species very abundant, both having blue wings, and otherwise coloured much alike, though of totally different genera. These were *Leprus wheeleri* and a *Trimerotropis* which I took for *T. cyaneipennis*, but which Mr. S. H. Scudder tells me is distinct and apparently undescribed. As the blue of the wings appeared to be certainly a pigmentary colour, and much resembled the vegetable anthocyans, I detached one of the wings of *Leprus wheeleri*, and boiled it in dilute hydrochloric acid. As I had hoped, but hardly ventured to expect, the blue at once became red. Heating the thus reddened wing in liquor potassæ did not change it back to blue, but caused it to turn yellow. I infer that the blue pigment has a red (acid) phase, but that strong alkali will destroy it altogether, leaving a yellow coloration which is of a different character. It is difficult to avoid the conclusion that the redness or blueness of the wings in these grasshoppers may result from the action of some environmental factor (*e.g.* the juices of plants eaten) upon the pigment, and that this accounts for the colour-similarity of diverse species living at the same place. Of course, this is not supposed to account for the similarity of the colours of the tegmina and thorax, of which the various shades of grey, red and brown resemble those of the rocks and ground.

T. D. A. COCKERELL.

Mesilla Park, New Mexico, U.S.A., April 17.

Valve Motions of Engines.

IN your number of December 14, 1899, Prof. John Perry mentions a diagram by Mr. Harrison. This diagram is the same as "Das bizentrische polare Exzenterschieberdiagramm" of F. A. Brix in the *Zeitschrift des Vereins Deutscher Ingenieure*, April 10, 1897.

There is only a small difference, as Mr. Harrison finds the distance OC by means of a circle with radius = length of connecting-rod, and Mr. Brix finds that distance by calculating it out of $\frac{R^2}{2L}$, (R = length of crank, L = length of connecting-rod). Now OC has not exactly that value, but the fault made therewith is much smaller than the fault made by describing the circle. Therefore the method of Mr. Brix is preferable to that of Mr. Harrison.

F. J. VAES.

Rotterdam, April 14.

MR. BRIX seems to have solved only the simple case of a valve worked by an ordinary eccentric. There are other good graphical solutions—for example, by Coste and Maniquet in a modified form of the Reauleaux diagram, which gave accurate results. Mr. Harrison's diagram is more general and is applicable to link and radial valve-gears and to all motions which are composed of a simple harmonic vibration with a small octave superposed. It may be used for velocities and accelerations as well as mere displacements. As to calculating the distance OC by the formula $\frac{R^2}{2L}$, instead of using the construction of the circular arc, this is a matter of no importance because there is no appreciable difference in the answers.

April 28. JOHN PERRY.

Drunkenness and the Weather.

I NOTICE in your issue of March 15 a communication from Mr. R. C. T. Evans, of Gray's Inn-road, W.C., calling attention to a probable error in my deductions in the paper which appeared in your issue of February 15, under the title "Drunkenness and the Weather." He says, "When a man is intoxicated and commits an assault, the result is entered in the police reports as 'assault,' the more serious offence overshadowing the less ; so that in all probability many of the cases of assault referred to in the statement were also cases of drunkenness, but were not tabulated as such. Studying Prof. Dexter's curves in this light, we may reasonably conclude that the number of those arrested for drunkenness or its results, varies but little throughout the year."

Although his supposition seems a reasonable one, a fuller statement of the conditions of the study will show that the fluctuations of the "drunkenness" curve cannot be so easily accounted for.

First, the monthly occurrence of arrests for drunkenness for New York City is more than twice that for assault, even in the summer, when the former are at the minimum and the latter at the maximum for the year, and if we suppose that every person arrested for assault in the summer was also intoxicated and would have come into the hands of the law for that crime if he had not for the other, even this would not bring the drunkenness curve up to its normal for the winter months.

Second, the method of recording crime by the New York City Department of Police makes this practically impossible. Misdemeanours are there classified and recorded under 183 different headings. The two which I have compared are "assault and battery" and "intoxication." There are, however, four other classes of assault besides, one for "intoxication and disorderly conduct," equalling that of "assault and battery" in the annual number of arrests, besides one for "fighting." A letter just received from the Clerk of Police says, "The crime of intoxication and fighting—a drunken brawl—would be classified in the statistics as 'intoxication and disorderly conduct.'" A careful analysis of all the conditions would make it seem that only occasionally would arrests for "assault and battery" encroach upon the data of drunkenness. I believe they might sometimes do so, but not sufficiently often to materially influence the curve.

EDWIN G. DEXTER.

Greeley, Colo., April 17.

SOME SPECULATIONS AS TO THE PART PLAYED BY CORPUSCLES IN PHYSICAL PHENOMENA.

IN some experiments described in the *Phil. Mag.* October 1897, I showed that in the kathode rays there were present bodies whose mass was exceedingly small compared with the masses of ordinary atoms ; these masses, which carry a charge of negative electricity, I called "corpuscles." Ever since then I have indulged in speculations as to the possibility of these corpuscles existing in a free state in ordinary matter not under the influence of the very intense electric field which are associated with the kathode rays. As recent work has produced some evidence of the free existence of these corpuscles, I have thought that these speculations might be of some interest to a wider circle than that to which they have hitherto been addressed. In the *Phil. Mag.*